

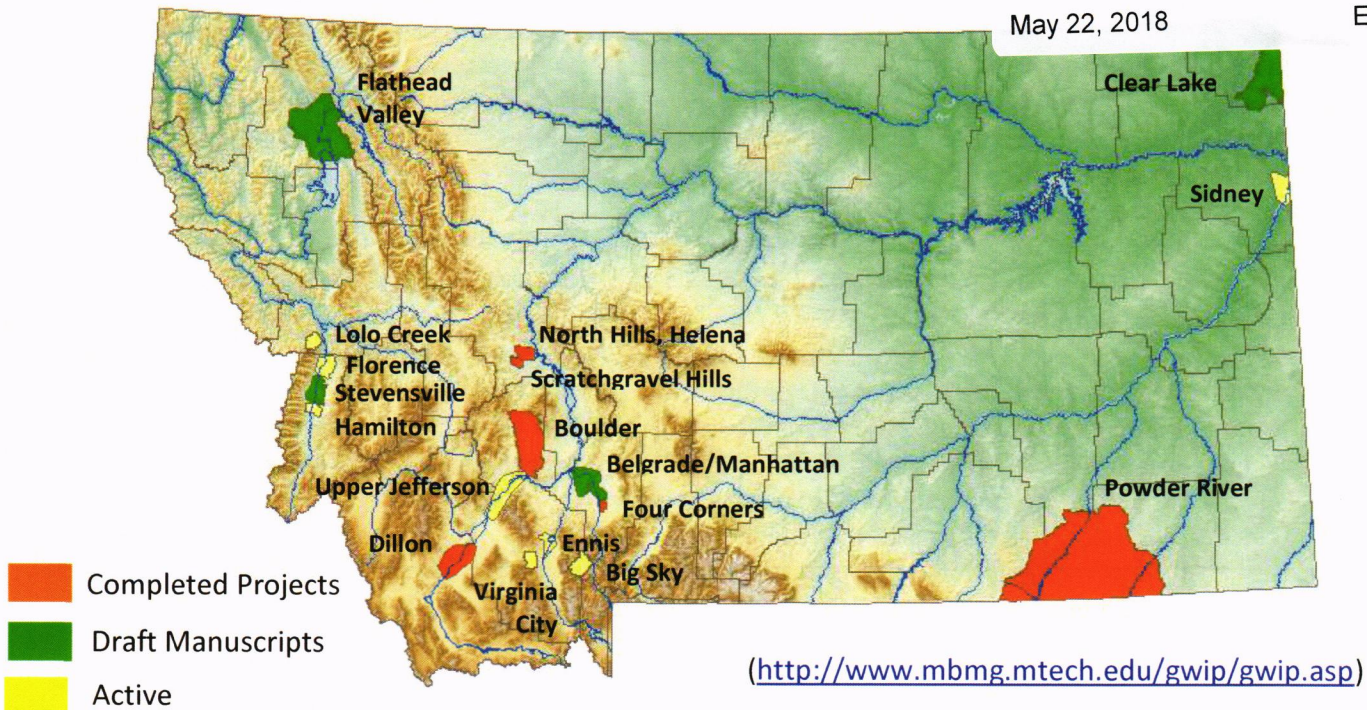
The **Ground Water Investigation Program (GWIP)** answers locally identified, site-specific questions prioritized by the Montana Ground Water Steering Committee (MCA 85-2-525). As mandated by the Montana Legislature, GWIP conducts research on the most urgent water issues in the State.

WATER POLICY INTERIM  
COMMITTEE 2017-18

**GWIP PROJECT MAP**

May 22, 2018

Exhibit 5



Groundwater monitoring



Groundwater/Surface water interactions; measuring canal and stream flows



Water chemistry





# **MONTANA BUREAU OF MINES AND GEOLOGY**

## **Ground Water Investigation Program**

### **ACTIVE PROJECT SUMMARIES (2017-2018)**

#### **PROJECTS WITH DRAFT MANUSCRIPTS COMPLETED IN 2017-2018**

**Project:** Clear Lake Aquifer; Sheridan County

**Purpose:** Evaluate Clear Lake aquifer response to groundwater withdrawals and provide analyses that will be used to assess development and wildlife decisions.

**Results:** There is no hydraulic connection between the aquifer and Medicine Lake. Model scenarios indicate that moderate additional irrigation development in the South Medicine Lake area is unlikely to significantly impact wetlands or streamflow in Big Muddy Creek.

**Personnel:** Jon Reiten (Lead), Kevin Chandler

**Project:** Stevensville Area; Ravalli County

**Purpose:** Evaluate the feasibility of using groundwater to supplement or replace irrigation water currently supplied by water diverted from the East Channel of the Bitterroot River.

**Results:** Numerical modeling indicated that the shallow alluvial aquifers can likely produce the amounts of water needed for irrigation. Results suggest that the complete conversion of all lands serviced by surface-water diversions to groundwater would lead to a significant reduction in the flows out of Mitchell Slough.

**Personnel:** Kirk Waren (Lead), Todd Myse, Dean Snyder

**Project:** Four Corners; Gallatin County

**Purpose:** Examine the effects on groundwater recharge and aquifer sustainability of converting irrigated lands to urban uses. Develop a numerical groundwater model to evaluate potential future land-use changes on the hydrogeology.

**Results:** Groundwater conditions in the Four Corners area have changed little since the 1950s, but future changes in land use, irrigation practices, and climatic conditions are likely to reduce groundwater availability. The aquifer in this area is directly connected to streams and irrigation water. Increased use of groundwater and/or large-scale changes in irrigation practices can potentially result in groundwater declines.

**Personnel:** Tom Michalek (Lead), Mary Sutherland

**Project:** Kalispell Area; Flathead County

**Purpose:** Determine whether withdrawals from the deep aquifer affect surface-water resources; and (if current stresses are creating declining water-level trends).

**Results:** Pumping appears to have created water-level declines in limited areas, but not valley-wide. The deep aquifer is interpreted to be effectively protected from contamination by the confining unit. This unit also constrains pumping drawdown to the deep aquifer. A 3-dimensional hydrostratigraphic model has been constructed and will allow future users to access lithologic information for any location in the valley.

**Personnel:** John Wheaton (Lead), James Rose



## DRAFT MANUSCRIPTS COMPLETED IN 2017-2018 (CONT.)

**Project:** Upper Jefferson River Valley; Jefferson, Madison, and Silver Bow Counties  
**Purpose:** Evaluate the effects of current and potential future groundwater withdrawals and changes in land use on baseflow to Willow Springs, Parson's Slough, Jefferson Slough, and the Jefferson River.  
**Results:** Lining irrigation canals in conjunction with switching from flood to pivot irrigation in the Waterloo area would result in the greatest reduction in Jefferson River flows. In the Whitehall area, modeling predicted that ground water pumping effects from residential development was greatest in areas where the land was previously irrigated in combination with pumping from the new wells.  
**Personnel:** Andy Bobst (Lead), Ali Gebriel

## PROJECTS THAT ARE ACTIVE

**Project:** Hamilton Area; Ravalli County  
**Purpose:** Examine the effects on groundwater and surface water of current and potential future groundwater withdrawals from residential/subdivision development.  
**Status:** Data collection is complete. Data interpretation and report writing is in progress. Development of a groundwater flow model will commence in 2019 to further evaluate the effects of current and future housing development on water resources.  
**Personnel:** Todd Myse (Lead), Dean Snyder, Ginette Abdo

**Project:** Big Sky; Gallatin and Madison Counties  
**Purpose:** Evaluate the sustainability and production capacity of the Meadow Village aquifer and the feasibility of groundwater withdrawals from bedrock aquifers in the Big Sky area.  
**Status:** Data collection is complete. Data collected from 15 monitoring wells installed for the project will be used to refine the numerical model of the sand and gravel aquifer, and to evaluate how current and future water demands will affect groundwater and surface-water availability. An interpretive report for the larger Big Sky area will include a conceptual hydrogeologic model for the bedrock aquifers.  
**Personnel:** Kirk Warren (Lead), James Rose

**Project:** Manhattan/Belgrade; Gallatin County  
**Purpose:** Determine if groundwater levels or the annual groundwater flow has declined in response to pumping pressures and land-use change over the past 60 years. Examine potential effects of future groundwater development on groundwater and surface water. Investigate changes in groundwater quality that may be related to increased wastewater disposal.  
**Status:** Data collection is complete. The numerical model has been developed to evaluate the effects of high-capacity wells on groundwater and surface water. The report is in preparation.  
**Personnel:** Tom Michalek (Lead), Mary Sutherland

**Project:** Lolo Creek; Missoula County  
**Purpose:** Determine the cause(s) of changes in streamflow character that have occurred in the lowest reaches of Lolo Creek, resulting in the channel occasionally being dry. Possible causes of the dry creek episodes range from climate, water withdrawn from the creek, groundwater pumping, changes in surface storage and groundwater recharge, and geomorphological changes.  
**Status:** Data collection is complete. The groundwater model is under construction. In conjunction with hydrogeologic interpretations, the model will help quantify each likely impact.  
**Personnel:** John Wheaton (Lead), Cam Carstarphen, Ali Gebriel



## PROJECTS THAT ARE ACTIVE (CONT.)

**Project:** Virginia City; Madison County  
**Purpose:** Estimate sustainability of the public water supply springs under scenarios of increasing demand and adjacent future development. Investigate the potential of augmenting the municipal springs with a well(s).  
**Status:** Geologic mapping, LiDAR collection, monitoring well drilling, and aquifer testing are complete. Groundwater and surface-water monitoring will be completed by June 2018. The information will be used to evaluate the source of the springs, and to identify potential well sites for future development.  
**Personnel:** Andy Bobst (Lead), Tom Michalek

**Project:** Lower Yellowstone Buried Valley Aquifer; Richland County  
**Purpose:** Determine the availability of water from the Lower Yellowstone Buried River Channel aquifer in the Sidney area and the aquifer's ability to meet the needs for future municipal water and oil and gas development water.  
**Status:** First round of drilling completed, monitoring network established. Drilling will continue in 2018. A numerical groundwater model will be used to verify hydrogeologic conditions, make predictions on water use, and be used as a water management tool.  
**Personnel:** Jon Reiten (Lead), Kevin Chandler

**Project:** Ennis Area; Madison County  
**Purpose:** Investigate the effects of increased residential development and groundwater withdrawals in the bedrock aquifer on the west side of the Ennis Valley. Implications for increased withdrawals on adjacent aquifers will be considered.  
**Status:** Work plan completed. Monitoring network being developed.  
**Personnel:** Andy Bobst (Lead), Mary Sutherland

## THE PUBLIC RECEIVES RESULTS IN REPORTS, PRESENTATIONS, AND INDIVIDUAL QUESTIONS TO THE SCIENTISTS:

- ✓ Detailed, peer-reviewed MBMG reports have been published, with more in review.
- ✓ Computer models of site-specific groundwater flow are available to the public for continued use.
- ✓ Scientists answer numerous inquiries regarding the hydrogeology of GWIP areas.
- ✓ Comprehensive set of hydrogeologic data for each site are permanently stored online.

## GWIP PROGRAM INFORMATION

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